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Working Paper Series

METHODOLOGIES AND THEMES FOR THE ANALYSIS AND EVALUATION OF INDUSTRIAL POLICIES: A SURVEY OF RECENT O.E.C. STUDIES

by
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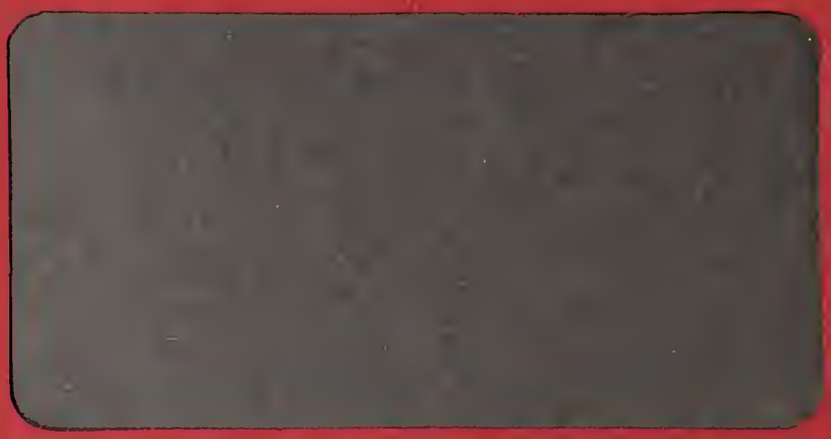

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Methodologies and Themes for the Analysis and Evaluation of Industrial Policies: A Survey of Recent O.E.C. Studies

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If you would like to receive additional information concerning any of the above studies, please detach this segment, enter the numbers assigned to the studies and mail with your name and address to:

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II In Search of a General Theory

Canadian industrial policies number in the hundreds. They are implemented through a wide variety of programs and instruments. It is tempting to write a general theory that can simplify the enormous array of industrial policy information. It is tempting to develop evaluation procedures against which the success or failure of particular industrial policies can be measured. It is tempting to provide guidelines that governments should follow in their creation of new industrial policies. Not surprisingly, some economists have yielded to these temptations.

In their book, Industrial Policy in Ontario and Quebec, Davenport, Green, Milne, Saunders, and Watson develop a set of taxonomies under each of which they list and describe industrial policies that share particular characteristics. They consider five different classes of instrument: tax favours, in-kind assistance to firms, cash assistance to firms, regulation, and government procurement policies. They examine the growth of subsidies over the past twenty years and note the siginificant increase in provincial government spending on such policies. They provide details concerning provincial loans and guarantees.

The authors offer six possible explanations for the recent growth of Canadian industrial policies:

1. an increased concern with "market failure" as found in externalities, public goods, gaps between social and private risks, or pockets of substantial market power;

2. a more intense desire to foster a particular quality of life that depends on expansion of manufacturing and minimization of foreign ownership;

3. a response to stagflation and to external economic shocks such as oil price changes;

4. an attempt to establish provincial rights and responsibilities as part of the continuing federal-provincial struggles for power;

5. the increasingly successful attempt of private interests to obtain special concessions as a natural part of their rent-seeking behaviour; and

6. the desire of workers to retard industrial adjustment since their fixed household investments would otherwise be severely harmed.

The authors conclude by suggesting several avenues for future research, including: calculation of private costs involved in various types of adjustment processes; analysis of inconsistencies among industrial policies; calculation of the impact of individual policies; examination of inter-governmental conflicts over industrial policies.

One of these authors, Bill Watson, has extended this search for a general theory in a Council book, A Primer on the Economics of Industrial Policy. For the foundation of his theory, Watson reaches back to Adam Smith and begins his book with the following quotation:

> The statesman who should attempt to direct private people in what manner they ought to employ their capitals, would not only load himself with a most unnecessary attention, but assume an authority which could safely be trusted, not only to no single person, but to no council or senate whatever, and which would nowhere be so dangerous as in the hands of a man who had folly and presumption enough to fancy himself fit to exercise it.
>
> Adam Smith, The Wealth of Nations

Watson emphasizes that the future is uncertain. This uncertainty makes economic planning by governments extremely difficult. Furthermore, since governments are not able to alter their planning quickly or easily, changing circumstances frequently make economic plans inappropriate as time passes. Watson extends the taxonomies of the earlier book which he co-authored. He places new emphasis, however, on the efficiency and adaptability of market processes and on the inevitable failures of government planning. He entitles one chapter, for example, "The Virtues of the Market, the Vagaries of Politics." He stresses the manner in which a myriad of industrial policies have been implemented as a response to the self-interested lobbying of particular business groups. On a technical level, Watson is critical of government's ability to achieve detailed or specific economic goals. One section of his book is headed, 'Strong thumbs. No fingers.'

Watson examines the general reasons for industrial policies - market failures, externalities, public goods, public versus private risk - and warns that "it is usually difficult to decide precisely how much public action is required ... and there is always the danger that too much remediation will simply replace one form of inefficiency with another." (page 63) "Although there are also many ways of patching up market failures, albeit in a rough and ready fashion, some probably cannot be repaired." (page 78)

Watson concludes with five policy guidelines:

- "if it ain't broke, don't fix it;
- if you can't fix it, don't try;
- if you're in the way, move;
- if you have to act, don't get fancy;
- if you choose the market, grease its gears."

Watson presents his general theory in an interesting and stimulating

manner. His book is the first of six industrial policy studies being directed, for the Council, by Richard Bird. At the conclusion of this project, Richard Bird will be writing his own report, drawing upon these studies to develop his own set of interpretations and insights concerning industrial policy.

III General Equilibrium Models

(A) FOCUS-PRISM

"FOCUS (Forecasting and User Simulation Model) is a second-generation, quarterly model of the aggregate Canadian national economy, developed and maintained at the Institute for Policy Analysis, University of Toronto. By current standards, it is of medium size, comprising more than five hundred variables, about three hundred of them endogenous. Included are all the major macro-economic variables of general interest, including GNP, national income, and their components; wages and prices; employment and unemployment; interest rates; international trade and capital flows; and the exchange rate.

"Focus has been especially designed for longer-term and policy analysis rather than short-run forecasting. To this end, it has been made congruent with current economic theory (for example, it pays careful attention to aggregate supply and to supply-side constraints), and many policy levers and options have been built into its structure (for example, a user can specify one of a number of targets for monetary policy, including the interest rate, the money supply, and the exchange rate).

"PRISM (the Provincial-Industrial Satellite Model) is a large but relatively simple annual model that expands FOCUS's national simulations into their provincial and industrial details. At present, it breaks out twenty-three industrial sectors and all ten provinces plus the combined territories. It is a direct but much expanded descendent of the models used to examine the Ontario economy in this study's predecessors (Foot et al. 1977; Sawyer, Dungan, and Winder 1978).

"PRISM operates in two major stages. In the first, the pattern of final demand derived from FOCUS is expanded into national industrial output, price, and employment detail, depending in part on an input-output framework. (The version of PRISM that we worked with used a 1977 input-output table.) The use of input-output relationships also allows for all required intermediate production.

"The second stage of PRISM is the estimation of provincial detail. Here PRISM depends first and foremost on provincial shares of the outputs of the different industrial sectors. Many of these shares are exogenous to the model, but those for most tertiary sectors (such as services and finance) are produced endogenously in a very simple fashion. Applying the shares to national industrial outputs (real and nominal) and summing across sectors yields provincial real and nominal GDPs. Additional simple relationships break down the nominal provincial GDPs into income components. Employment by province also depends on sectoral shares, adjusted for provincial differences in labour productivity. Provincial labour-source populations are exogenous, and participation rates are determined by simple relationships.

"For both the industrial and the provincial detail, PRISM users always enforce strict consistency with the FOCUS national totals, providing an important check on the provincial projections."

P. Dungan, D. Crocker, G.M. Garesché,
The Ontario Economy 1982-1995 (p. 11)

Endogenous variables are of two types: identities and behavioural variables. Identities are simply definitions or representations of accounting practices. The behavioural equations have been developed with reference to economic theory, and their parameters have been estimated from historical data using statistical fitting techniques.

The FOCUS-PRISM model can be solved simultaneously and can project the implications of policy changes over successive time periods. The Council has sponsored a variety of studies that use the FOCUS-PRISM model to simulate the results of hypothetical industrial policies. A basic set of these is presented in The Ontario Economy, 1982-1995, by Dungan, Crocker and Garesché. Having solved their equations as a base case, the authors introduce seven policy changes, one at a time. They again solve the model for each such policy change and consider how the ultimate results of each of these differ from the results originally found in the base case. The seven alternative projections develop from:

- an increase in government expenditures;
- an increase in personal income taxes;
- an increase in existing types of investment tax credits;
- a wage subsidy program;
- an increase in the target growth rate of the money supply;
- a large, one-time, exogenous outflow of capital; and
- an increase in U.S. interest rates.

The Council has recently investigated the economic implications of Ontario implementing its own separate personal income tax. As part of this investigation, the Council has used the FOCUS-PRISM model to ascertain the impact on a wide variety of economic variables of tax policies that could achieve an increase in labour force participation, an increase in total investment, an increase in total savings, or a decrease in the user cost of capital. Once again, this policy simulation technique has provided a tool for organizing, embodying, and remembering a huge number of relationships in order to project a likely scenario for the Canadian economy under a particular policy regime.

A third major project utilizing FOCUS-PRISM is currently being conducted by William Milne, as part of the Richard Bird studies referred to above. This will extend the range of policy experiments. In addition to specific policy changes, some broad questions will be addressed, such as the effects of general versus industry-specific policies and the relationship between industrial and regional policy.

The FOCUS-PRISM model will also be used in combination with other techniques to analyse the impact of tax changes - particularly sales tax changes. This study undertaken by Doug Crocker will examine the differences between tax changes which are announced to be temporary versus

those which are perceived to be permanent. While this is not a true industrial policy - it is more macro-oriented - the sales tax changes enacted in the past have usually been industry or sector specific and obviously this can be regarded as an indirect industrial support policy. The methodology of this project is as follows. Specific periods of past temporary tax cuts will be examined and the appropriate equations in the FOCUS model will be re-estimated to incorporate temporary and permanent tax variables. This will require the inclusion of a price expectations term in the consumption equations. Agents will then be able to reallocate their spending depending on the price they pay now versus an expected price in the future.

(B) The Richard Harris Model

The project by Richard Harris is an innovative and theoretically original approach to the old question of whether trade liberalization would result in positive or negative net gains for Canada. Professor Harris starts with a multi-sector general equilibrium trade model of the type developed by Evans, Brown and Whalley. These models usually have a fully competitive price clearing marketplace. They have been used to measure the precise welfare gain or loss incurred by multi or unilateral reductions in trade barriers. In general, these models have found the gains to free trade to be small, and because of this, they have been criticized by a group of Canadian economists led by Eastman-Stykholt and the Wonnacotts. Their critique concerns the implicit assumption that Canadian firms are operating at minimum efficient scale. They contend that this does not accurately represent the industrial organization of the Canadian manufacturing sector. Their work suggests Canada would gain significantly if we and/or our trading partners were to move towards free trade, because Canadian firms could then operate at a larger scale with lower unit costs.

Essentially, Professor Harris has managed to merge the two theories. He has built a general-equilibrium trade model consisting of thirty industries in which the industrial structure of the Canadian economy is explicitly modelled. Harris's methodology can be described in the following way. Cost estimates and elasticities of scale for each sector of the economy have been gathered from existing literature. These are included in the general equilibrium framework. Thus, the model not only determines the output of each industry but it also calculates the number of firms that can operate efficiently per industry and the degree of product differentiation within the industry. The model is based on a consistent set of figures - inputs, costs, wages, labour, capital, output, number of firms and products, tariffs, taxes, and subsidies - for one year, 1976. The parameters of the model are then adjusted until the endogenous variables within the model actually replicate the 1976 figures. Then, the policy experiments are simulated where a policy variable is changed and the model is allowed to solve for the endogenous variables. The results are then compared vis-à-vis the 1976 solution and the welfare gain or loss is calculated. At present the model is static but work is underway to make the project dynamic by extending the coverage period back to 1961 and by the direct incorporation of adjustment costs and sticky prices. In the model adjustment costs are represented by the fact that capital and some forms of labour are industry specific. Some prices are slow to adjust because of contractual obligations which carry over from period to period. Essentially these two factors combine to trace the gradual adjustment path the economy would follow if barriers to trade were removed.

IV Partial Equilibrium Models

Economists focus on the structure of the equation representing the production process, and the manner in which the independent variables interact to determine the dependent variable, or output. This has two important consequences for economic research. First, economists analyze many activities, such as education and cultural activities, from the perspective of the production process in a manner that non-economists may not appreciate. Second, it appears that different economic activities are best represented by different structural relationships. Consequently, many economists concentrate on a particular industrial sector with the objectives of first estimating the production relationships and then of calculating the impact of specific types of industrial policies.

David Gillen and Francis Tapon have undertaken a study of The Canadian Pharmaceutical Industry: Innovation and the Impact of Provincial and Federal Regulations. They are examining the performance of the Canadian pharmaceutical industry and the government's alternative policy options for it. Under the present policy of compulsory licensing, any firm can obtain the right to manufacture and distribute a patented drug by simply paying a royalty fee of four per cent. The licensee then sells in competition with the patentee exactly the same drug but under a different brand name, sometimes referred to as a generic drug. The purpose of compulsory licensing was to reduce drug prices by weakening the patent protection, and thus stimulating competition from licensees. Besides compulsory licensing, there are other policies, particularly at the provincial level, which include provincial drug reimbursement programs and product selection laws.

It is claimed that compulsory licensing has had a serious, adverse impact on the level of R & D in this industry. Tapon and Gillen are investigating the effects of compulsory licensing on R & D expenditures in Canada using a

partial equilibrium model. The framework of the proposed study is to consider the factors influencing the investment decisions by looking at the macroeconomic conditions, the global trends of the related sectors of the economy, the institutional setting and proper infrastructure in areas of clinical testing and marketing strategies, international aspects of the industry, tax concessions in other nations, the question of economies of scale in manufacturing, and the role of government policy regulations within the pharmaceutical industry.

While it is certainly useful to understand the relationship between R & D expenditure and productivity (innovation) and the impact of compulsory licensing on R & D expenditures, this study will go beyond the simple fact-finding explanation. The underlying question is the viability of a reasonable 'R & D' expenditure. Given the fact that only a very few pharmaceutical firms do 'R & D' in Canada, what other alternatives, if any, are available to compulsory licensing? Similarly, is the reduced incentive to invest in R & D due to the substitution provisions contained in various provincial drug plans?

A smiliar kind of approach is being pursued by F.J. Anderson and N.C. Bonsor in their study of The Pulp and Paper Industry. Over the past two decades, corporate taxation in North American manufacturing has been modified in regard to the taxation of net income on capital because of the appearance of the investment tax credit (ITC) and the progressive liberalization of depreciation formulas for tax purposes. Effective tax rates are sensitive to inflation rates. This has implications for investment behaviour in an inflationary climate. The ITC and accelerated depreciation reduce the effective tax rate through 'front-end' tax abatement. An additional issue is that a new firm that embarks on capital investment without a pre-existing income flow must claim its ITC and capital consumption allowances as the proceeds of

capital investment itself permit. The effect of this cash flow on the new firm is to reduce the after-tax internal rate of return (IROR) relative to the old firm and hence, raising the effective tax rate for the new firms.

Anderson and Bonsor are examining these features of Canadian and U.S. corporate tax systems on a comparative basis using the economic environments of 1980. Major new capital expenditure in Canada's largest manufacturing industry, Pulp and Paper, provides the investment vehicle for this analysis. They intend to focus on four issues:

1. The impact of tax treatment on profitability will be calculated, where IROR will be computed for major investment in this industry in Ontario, Quebec and the U.S. southeast. Before-tax and after-tax IROR will be calculated for each investment.

2. The effects of different fully-anticipated rates of inflation on real rates of return under each tax system will be examined.

3. a) The differences will be noted between effective tax rates for old and new firms.
   b) The impact of different types of industrial incentives on industry performance and behaviour will be analyzed.

4. The effect of different exchange rates on the profitability of the pulp and paper industry in Ontario and Quebec will be assessed.

It is likely that Anderson and Bonsor will find that there is a wide gap between nominal and effective tax rates in both countries and particularly in

Canada. Furthermore, the effective tax rates are higher for new firms than old firms, and this kind of differential may constitute a barrier to entry in the manufacturing sector.

The authors intend to use the following equations (1) through (3) as the theoretical foundations for the calculation of before and after-tax IROR for the paper and pulp industry:

$$K_o = \sum_{t=0}^{40} \frac{[S_t - C_t(1 + \delta)^t] (1 + \rho)^t}{(1 + r')t} \qquad (1)$$

where K_o is the initial capital investment, S_t stands for the annual value of sales of newsprint or kraft pulp in 1980 dollars, C_t is annual operating cost in 1980, δ is the annual rate of increase of operating costs due to rising labour costs, ρ is the anticipated rate of inflation, r' is the nominal before-tax IROR and r is the real before-tax IROR on the project over the 40-year planning horizon. The rate of growth of operating cost (δ) takes on various hypothetical values. Note that $r = (r' - \rho)/(1 + \rho)$.

The derivation of after-tax IROR requires that equation (1) be adjusted to include nominal taxation of revenues net of operating costs and to permit the firm to claim an ITC and allowable capital costs for tax purposes. With stable prices assumed, the real after-tax IROR (r^*) is given as the solution to:

$$K_o = \sum_{t=0}^{40} \frac{(1-T)[S_t - C_t(1 + \delta)^t] + T.D_t + Z_t}{(1 + r^*)t} \qquad (2)$$

where, in addition to the symbols already defined in (1), T is the nominal or statutory tax rate, D_t is capital recovery for tax purposes in year t, and Z_t is the amount of the investment tax credit (ITC) claimed in year t.

The introduction of fully-anticipated rates of inflation alters equation (2) to:

$$K_o = \sum_{t=0}^{40} \frac{(1-T)[S_t - C_t(1+\delta)^t](1+\rho)^t + T.D_t + Z_t}{(1+r_\rho)t} \qquad (3)$$

where r_ρ is the nominal after-tax IROR under conditions of fully-anticipated inflation at rate ρ. Just as before, the real after-tax IROR with inflation is defined as $r_x = (r_\rho - \rho)/(1+\rho)$.

Equations (1), (2), and (3) will be used to calculate three different types of IROR: real before-tax IROR for newsprint and Kraft pulp in two North American regions, real after-tax IROR for the two products in the two regions with stable prices, and real after-tax IROR for both products in both regions when prices are rising under fully anticipated inflation.

Based on the results and conclusions of this study of effective taxation in Canada and the U.S.A., and different IROR for old and new firms in this industry, the authors will suggest recommendations for future tax changes in Canada.

Ed West has just begun a study of cultural activities from the perspective of a production process. He is analyzing how various inputs enter the costs of performances, and how the demand for cultural activities is determined. It is likely that West will find himself developing different analyses for each type of cultural activity - and perhaps even for sub-groups within each of theatre, dance, and music. The purpose of these analyses is

to be able to decide upon the most appropriate types and levels of government assistance.

With quite a different approach, Geoffrey Bernstein uses quantitative methods to determine the effects of tax incentives on research and development expenditures in the private sector. Drawing on the theory of finance, Bernstein has developed a dynamic model that integrates R&D investment with firms' financing decisions in an environment with personal and corporate income taxes and specific R&D tax incentives. The estimated model will then allow simulation experiments that would help determine how the level of R&D expenditures respond to various incentives, taxes, and depreciation rules.

Bernstein's analysis starts with the following production function:

> Output = Function of (labour input, plant and equipment in the last period, R&D capital in the last period, plant & equipment investment, R&D investment)

Maximization of profits implies minimization of costs at any output level. In order to minimize costs, there has to be an optimal condition for plant and equipment capital, another one for R&D capital, and an optimal labour requirement function.

The firm is assumed to maximize the market value of outstanding shares. In order to do this, the cost of equity capital has to be minimized while the post tax flow of funds to shareholders has to be maximized. Maximizing the post tax flow of funds implies minimization of costs, which depends, apart from labour and the cost of capital, on the tax structure. The tax structure in turn is determined by the corporate tax rate, depreciation rules, plant and equipment tax credit, as well as research and development tax credit. It should be noted that interest payments are tax-deductible while R&D expenditures are immediately expensed.

In order to isolate the effects of tax and capital structure on the firm's decisions, the labour requirements function is used as a constraint facing the firm when it minimizes its costs. The labour requirements function is assumed to be linear-quadratic with non-separable internal adjustment costs. The labour requirements function is defined for each output level and depends on the capital stock and investment level for plant and equipment as well as research and development.

The model used by Bernstein is a dynamic model with both leads and lags in the equations. Consequently, static expectations are not assumed. He also does not assume constant returns to scale, does not assume separable adjustment costs, and does not assume exogenous financing. Consequently, the model enjoys a high degree of flexibility, permitting a number of interesting simulation experiments.

In 1982, Jim Williams completed a study entitled "Industrial Location and Trade in Ontario" which was released in the Ontario Economic Council's Working Paper Series. This study is concerned with the feasibility of industrial relocation as a device for solving problems of regional disparity. It considers the policy implications of the Heckscher-Ohlin Theory and the Central Place Theory. Williams assumes these theories can account for the specialization of industries in regions and for the location distribution of production among them. From empirical regression analysis on 100 industries in 54 Ontario counties, he finds that the percentage employment by county can be predicted by four types of variables relating to a) the presence or absence of resources, b) the population of the largest city in the county, c) county density, and d) the location of industrial suppliers or buyers. It is found that the Central Place Theory has greater explanatory power. Williams then concludes that policies which attempt to disperse the concentration of population impede those industries which benefit most from a location at the center of a population, as this would prevent them from capturing economies

of agglomeration and scale. Alternatively there are industries which demonstrate strong backward or forward linkages. Insofar as industries leads backwards to Ontario's resource base, they represent the influence of the Heckscher-Ohlin Theory and offer the best prospect for development in areas of lesser diversity.

V Non-econometric Theoretical Analyses

Given the widespread interest in the effectiveness of investment incentives in stimulating investment, Lok Ho, a research officer at the Council, set about the task of analysing the cost effectiveness of such incentives.

The choice of using analytical methods rather than statistical methods is prompted by the imprecision in the statistical results that have been generated. A recent survey article by Chirinko and Eisner, "Tax Policy and Investment in Major U.S. Macroeconomic Econometric Models", Journal of Public Economics, March 1983) find wide variation in the stimulative effects predicted by six major U.S. quarterly models, largely reflecting critical differences in specification of the investment equations. In general, the more complex the model is, the more difficult it is to show that it is right or wrong, since it is difficult to disentangle the multitude of assumptions affecting the simulation results. Chirinko and Eisner remark cynically, "One can get almost any answer one wants by making sure that the chosen model has specifications appropriate to one's purpose." (p. 139)

Ho's analytical model is extremely simple. No specific production function need be assumed. Input and output prices do not enter directly in the analysis. The same simplicity is shared by Tobin's q theory of investment. However, Ho's model is suprisingly powerful in generating strictly analytical results about the cost effectiveness of investment incentives.

The basic assumption is maximization of "net worth increase" made possible by the investment. The net worth increase function can be represented by:

$$\frac{I(1+g)}{1+r} - I$$

in the absence of taxes and incentives. g is the expected rate of return over the economic life of the capital assets. r is the rate of discount. This expression is changed to the following when various investment incentives are introduced along with corporate income taxes:

$$\frac{I(1+g)}{1+r} - I - \frac{t(\ I(1+g) - d(1+r)I\ )}{1+r} + sI$$

The third term in this expression represents the capitalized value of tax payments when the tax rate is t and the deductions rate is d. The last term is the investment subsidy, assumed to be paid concurrently with the investment expenditure.

It is straightforward to derive the following optimal investment level:

$$I^*(t,d,s) = \frac{g - r - t(1+g - d(1+r)\ ) + s(1+r)}{(\frac{1+g}{1+r}\frac{\delta r}{\delta I} - \frac{\delta g}{\delta I})\ (1 - t)}$$

Since I^* is a defined function of t, d, and s, analysis of the cost effectiveness of the various incentives can be undertaken.

In another study, Lok Ho has examined two objectives for industrial policy formulation: reducing the rate and duration of unemployment, and raising real per capita income in a sustained manner. Ho has noted that having more objectives is likely to make planning more difficult, ultimately forcing policy makers to review their priorities on a regular basis and rendering long term planning impossible. Lok suggests that it is best to translate other policy objectives into minimum standards, and then use these standards as constraints. One might ask why the two objectives were chosen. Regarding the first objective, unemployment is unlikely to abate significantly in the short run, and until it has fallen to historic levels, it is going to remain a priority for policy makers. We may, therefore, put reducing unemployment as a key objective for industrial policy as long as unemployment is above say,

six or seven per cent. Raising per capita income is important because, other things being equal, it is directly related to economic welfare. We do not set any level of real per capita income or any growth rate of real per capita income as a constraint because the economy should be encouraged to do the best it can and because targeting at any growth rate is likely to be either unnecessarily pessimistic or unrealistic.

Both macro and micro policies have a part to play in industrial performance and consequently in an industrial strategy. Lok's study will look at these policies as tools of managing three important determinants of economic performance: risks, incentive structure, and information.

- Policies should be in place to reduce risks for private decision makers so that they can plan better and further ahead and be less susceptible to unnecessary financial and cyclical strains.

- The environment should foster activities conducive to the achievement of the stated goals. Productive activities should be encouraged and activities damaging the economic health of the country should be discouraged.

- Sufficient information should be provided to enable private decision makers to act in ways contributing to the achievement of the objectives.

In a different study of high tech incentives, Yehuda Kotowitz sees government backing of R&D as a positive industrial strategy in the sense that it supports high technology industries which are expected to become "winners". He concludes that there may be a theoretical basis for supporting R&D, while noting that the evidence for R&D to be a positive factor for industrial growth is not conclusive. Considering the nature of the innova-

tions and the advantages and disadvantages of being first in a market, however, Kotowitz concludes that "it is the lowly imitative R&D which is most likely to yield excess social benefits" and thus require government support. The case for supporting original, export-oriented R&D in a small open economy like Canada is very weak. Industries which encounter extensive competition in product markets and which are protected from foreign competition are the most likely to benefit from government support. This study by Kotowitz is based on a survey of the literature and some theoretical qualitative analysis.

Chris Green is currently developing a study that sees Industrial Policy as a Response to Economic Exigency and Political Reality. Two competing views about industrial policies are that they are sought by their beneficiaries and supplied by a political process in which campaign funds, electoral footwork, and single issue voting are paramount, or that they are a reaction to economic exigency and hardship and are supplied by a political process that feels obliged to act - and in the most practical, if not economically efficient manner. These two views are not necessarily mutually exclusive. Economic exigency may stimulate endangered groups to seek protection and the democratic process may force elected representatives to respond even if the response, or for that matter responding at all, is against their better judgement.

The relevant issues are not new, since a dynamic and growing capitalistic system, accompanied by rising real wages, produces some "losers" as well as many winners. Capitalism is thus left open to attack - and an attack which is made politically more feasible by the democratic process. This situation paves the way for protectionist and rent-seeking behaviour as well as for compensating policies for losses due to "inexorable" economic processes.

Some individuals and groups may find the capitalized value of their growing wealth quickly transformed into losses as a result of unforeseen economic changes. Even where the economic changes are at least partially foreseen, economic adjustment may be slow or incomplete because of the non-portable and imperfectly transferable nature of some important forms in which households hold their wealth.

The attempt to legislatively protect against economic losses has, however, undermined economic flexibility and has thereby rendered macro-stabilization policies less effective. One political response has been to place greater emphasis on micro employment and growth policies (the "new" industrial policies). Although seemingly inferior on efficiency grounds to well managed macro-stabilization policies, the "new" industrial policies are sometimes more closely attuned to the fact that households and government, as well as firms, have production functions with important "fixities" in them which reduce, for some economic agents, at least, both their flexibility and their gains from mobility.

This study is intended to provide an historical context to the current industrial policy "rage", to expand the theoretical framework employed in evaluating industrial policies by employing the idea that households are producing as well as consuming units, and to attempt at least some empirical tests of the implied hypotheses.

The Council hopes to sponsor a project that will examine technological change from the perspective of entrepreneurs and their individual firms, and that will consider their views and experiences in regard to high tech industrial policies. This project will question whether Ontario can learn from what has happened in high tech communities in other nations. It will ask whether lessons can be learned from existing agencies such as the Ontario Research Foundation. It is hoped that this approach will be able to assist Ontario's

new high tech centres and the IDEA Corporation in their efforts to stimulate innovation, and will be able to define an optimal policy stance for Ontario in the high tech sphere of industrial policies.

VI The Impact of Price Regulations on the Determination of Quality

Within the Communist countries, a long and substantial history has developed concerning the impact of government regulations on the determination of quality. In the U.S.S.R., prior to the 1965 reforms, the allocation of centrally planned production quotas to individual plants often resulted in a disregard for quality considerations and an attempt to achieve production goals by minimizing the variety of output and concentrating on those product versions that could be manufactured most easily. The 1965 profit reforms attempted to make producers more sensitive to customers' wishes. With prices set centrally, however, the individual plant could still achieve its targets and fail to manufacture appropriate products since there was no guarantee that central planners would be able to set all prices appropriately. In fact, given a centrally determined price, the plant might maximize profit by allowing quality to deteriorate.

In Canada, economists have just begun to appreciate the impact of government regulations on the determination of quality. A 1981 Council book by Richard Arnott investigates Rent Control and Options for Decontrol in Ontario. In this, Arnott has developed a new conceptual framework that includes quality explicitly. Under price control, quality is consciously manipulated in order to maximize profit. The nature and results of such manipulation are a subject matter to which Canadian economists will likely devote increasing attention. Arnott's book is extremely important in that context.

A different approach to this issue is presented by John Todd in his forthcoming Council book, Price Competition in the Canadian Securities Industry: A Test Case of Deregulation. Prior to April 1, 1983, Canadian stockbrokers were not permitted to compete with each other on the basis of price. The commission rate schedule was set by the Ontario Securities Com-

mission. It was feared that price competition would reduce the quality of service provided by stockbrokers, particularly in the area of research. Todd examines this issue using a theoretical framework, and then presents explicit predictions concerning the post-April 1, 1983, price deregulation. In the process, Todd describes the practical difficulties encountered by a government agency in its attempts to determine appropriate prices, considering the quality issue.

VII The Analysis of Technical Change

Economists are struggling to understand production processes and to estimate parameters that reflect the interrelationships within those processes. Economists are advancing with the development of increasingly detailed, general equilibrium models that contain more appropriate structures and parameters. Economists are also advancing with more sophisticated analysis of individual sectors such as automobiles or pulp and paper, and with more rigorous pursuit of individual themes, such as aid to workers in declining industries and government attempts to pick winners.

At the same time, however, economists are becoming increasingly aware of the fact that these relationships are constantly changing, even while they are being examined. The basic problem, then, is how to extend one's analysis beyond historical description through the inclusion of the process of change within one's analysis itself. The process of quality adaptations has been the focus of some earlier remarks. At this point, let us turn to the study of technical change.

A useful place to begin is with a 1982 Council book by Denny and Fuss, Productivity: A Selective Survey of Recent Developments and the Canadian Experience. The authors examine various definitions of productivity and demonstrate the measurement problems that each encounters. A key point is that some elements of the process of technical change can be quantified and included explicitly in one's analysis, with the result that residual productivity measures are diminished in size. Scale economies and the impact of education are examples of this. Consequently, "we warn that studies can be compared validly only if one is aware of how the variables have been measured and of what definitions of productivity have been used." (page 13).

Denny and Fuss investigate what they refer to as "the Great Productivity Slowdown," that has occurred since 1973. They emphasize that this

productivity slowdown has not occurred uniformly across industries, but rather has varied substantially among industries. They note that the Great Productivity Slowdown has been a world-wide phenomenon. They conclude that "at neither the regional nor the international level do we have an adequate understanding of the causes of productivity differentials. The recent concern over the Great Productivity Slowdown is symptomatic of our problems in understanding the processes that underlie changes in productivity." (page 53)

Tim Hazeldine's work, The Productivity Slowdown in Canadian Manufacturing: Explanations and Implications for Industrial Policy, is an attempt to understand those processes. Traditional methodology has been predicated, according to Hazeldine, on the assumption that firms in the same industry operate on the same production function and in a perfectly competitive environment. It is this assumption that has permitted researchers to use highly aggregative data to examine the effects of such factors as capital/labour ratios, quality of capital, technical change, demographic changes, regulation, capacity utilization, and structural change. In an initial study completed for the Economic Council of Canada, Hazeldine found considerable heterogeneity among firms, casting doubt on the assumption of a standard production function. Using the same disaggregated data base that he used in his ECC study, Hazeldine hopes he can improve on previous explanations of the productivity slowdown in Canadian manufacturing.

Hazeldine will take advantage of the newly computerized database developed by Statistics Canada from their annual Census of Manufacturers. In this, each plant or firm is assigned a unique identifier and so can be traced from the year that it first shows up in the Census to the year that it disappears. In practice, his study will be based primarily on 4-digit SIC

level data, assembled for the periods 1970-73 and 1973-79. When warranted, further disaggregation will be done to reveal components of productivity growth within industries.

The novel thing about Hazeldine's study, apart from the use of a more disaggregated data base, is an elaborate accounting framework that will enable the fall in productivity growth for the manufacturing sector to be broken down into its component parts - shifts in the pattern of demand across industries; changes in the rate at which new plants are born and old ones exit; changes in the degree of improvement in productivity embodied in new technology; changes in the rate at which existing plants are improved over time.

This accounting exercise is in a sense a data generation procedure whereby the changes in productivity performance can be systematically split up into parts that can be subjected to standard econometric analysis.

VIII The Labour Force and Industrial Policy

James Davies and Glenn MacDonald have recently completed a study, Information in the Labor Market: Job-Worker Matching and its Implications for Education in Ontario. Their theoretical framework is an informational model which assumes that some individuals are better suited to certain jobs than others. From this perspective, an important part of education is the discovery of the best job-worker matches. "Education is productive in that it improves the allocation of resources. Viewed this way, the value of some types of education whose worth is sometimes called into question - e.g., Arts and Science study at the universities - becomes more evident. In addition, the explanations of some of the recent trends in education - e.g., the movement away from Arts toward more vocational study - become clear. These new insights provide an immediate gain in terms of our understanding of appropriate policy initiatives." (Manuscript, p.2). The Davies-MacDonald project examines education as an important element in the production process of many economic activities, and it can be seen as a set of insights upon which industrial policies affecting the education of the work force might be based.

In a study of one particular labour skill - tool and die makers in Ontario - Noah Meltz shows that, from 1968 to 1980, there were gross vacancies. Meltz argues that a shortage existed because of three types of market failure: the low rate of apprenticeship completions, about 50% during the 1970's, lack of major links between employees and community colleges, and the reliance on immigration to Canada to fill this type of skill vacancy. Meltz's recommendations involve shifting the cost of apprenticeship training from the apprentice to government and expanding the role of community colleges in training tool and die makers.

Recent research by Abbott and Ashenfelter focuses on the statistical methods used to evaluate employment and training programs. These authors survey the numerous manpower experiments undertaken in recent years (primarily in the United States) to pull together a description of these studies' methods and findings. Their basic question is what can policy-makers learn from the host of recent evaluation studies regarding the best approach to labour supply policy? Their underlying premise is that a description and assessment of the statistical methods employed in the evaluation is an essential prerequisite for interpretation of their empirical findings. Indeed, the authors suggest that as much may be learned from the methods by which the evaluation findings are generated as from the substantive findings themselves. In any case, the authors assert, assessment of the reliability of an evaluation's findings cannot be formulated independently of assessments of the appropriateness and validity of the evaluation's statistical design and method.

The authors confine themselves exclusively to evaluations of supply-side manpower programs. These include employment and training programs and mobility programs; their common characteristic is that they treat individual workers. This characteristic dictates the authors' reliance on a microeconomic theoretical framework. Also, both types of programs have the same general objective: to increase participants' post-program earnings. This objective provides the principal criterion for evaluating the success or failure of supply-side programs. Therefore, the overall methodological approach of Abbott and Ashenfelter is an emphasis on appropriate econometric implementation of a microeconomic model of individual earnings.

In contrast, another Council study by Dawson, Denton and Spencer views labour market policy from a macroeconomic perspective. The authors of this study are principally concerned with the effects on the overall economy of the size and quality of the labour force. The authors consider in detail

the ways in which training or retraining programs affect the future level and distribution of skills in the labour force, and thus the level of labour productivity throughout the economy. They also discuss the ways in which immigration affects the future size, age structure and skill composition of the working population. The authors' principal contribution is a formal theoretical macro-model which incorporates manpower training and immigration. The model is used in a series of simulations to illustrate how the economy responds to training and migration in the long run and how aggregate costs and benefits combine to determine net effects on per capita output. The simulations include results for differing rates of technical adjustment, for the case of a skilled level 'bottleneck' with unskilled unemployment, and for different rates of technical progress.

Sandra Tychsen, a Research Officer at the Council, investigates an area new to industrial policy, but old as a policy problem: the contentious area of industrial safety and health. The impetus for this research is a new piece of provincial legislation that strikes an innovative path in the area of occupational health and safety policy.

In the past, there have been two polar approaches to policy in this area. One depends on government-imposed and enforced standards and regulations. The other relies on the operation of market incentives - the incentives to minimize the costs of hazardous pay premiums and worker compensation and the costs from lost work time and equipment damage. In Ontario, the new legislation attempts to harness the incentives operating at the level of the firm 'safety production function' by mandating firm-level joint worker-management committees. These safety committees have 'internal responsibility' for devising safety policy at the firm level. Government involvement is present, but is minimized.

The research by Tychsen uses microeconomic analysis to examine the incentive structure implicit in the Ontario legislation. In particular, the

study analyses the effects on resource allocation of the legislation. Standard economic analysis generally shows that the productivity of various safety expenditures should be equated at the margin to avoid large discrepancies in costs per life saved across safety programs. Also, willingness to pay should be used to indicate workers' valuation of different programs. In numerous previous analyses, the problems and exceptions to these guides have been thoroughly set out. In this analysis, the guides are accepted as conventionally formulated, but are evaluated in terms of recent economic models of regulation which incorporate the demand for protection. The theme is that the seemingly irrational allocations to programs for work health and safety may nonetheless be consistent with rational preferences. The solution comes from merging the individual utility-maximization model with the firm production function for safety.

The study also examines the data available for testing the main propositions of the model. A primary limitation is that few appropriate data are currently generated from the Ontario program. The author provides suggestions for revising current biases in the data in order to generate improved assessments of relative industrial and occupational risks.

Another important theme in industrial policy has been the problem of production losses to the economy from industrial strikes. As governments reconsider their policies regarding collective bargaining and the management of strikes, an important first question emerges: How much do strikes really cost?

In the research they have undertaken for the Council, Reder and Neumann make an important first attempt to gauge the overall cost to the Canadian economy from output loss due to strikes in manufacturing industries. The 'cost of strikes' is defined as total measured loss in output over a two-year reference period around the strike, and is specifically formulated to

account for intertemporal substitution in production by way of pre-strike inventory accumulation and post-strike re-accumulation.

The authors' methodological approach is to employ the fairly unusual formulation of vector autoregression. Their autoregression formulation is derived from a two-equation model which describes monthly output levels and strike activity across eighteen industries over the period 1960-1976.

Output and strike activity are represented as a bivariate autoregressive process with a maximum lag of twenty-four months. The effects of seasonality and trend are removed by regression on seasonal dummies and a linear trend.

From a completely different perspective, Ron Saunders has examined "Aid to Workers in Declining Industries." Saunders considers this segment of the labour force as deserving special assistance in retraining and re-location. The process of industrial progress creates losers as well as winners; and society bears a responsibility to cushion the hardship experienced by workers unemployed in this process.

IX The Choice of Instrument for Industrial Policy

Crown Corporations in Canada: The Calculus of Instrument Choice is a 1983 Council book, edited by Robert Prichard. It contains a series of essays which thoroughly analyze particular aspects of Canadian Crown Corporations.

Trebilcock and Prichard investigate the legal and institutional characteristics of Crown Corporations, including issues such as the problem of definition, the modes of creation, Crown immunity, taxation, labour relations, accountability and sources of funds. They compare public ownership with private sector regulation as a means of implementing government policy, and within public ownership they compare Crown Corporations with Departmental Bureacracies. They examine various reform proposals to enhance accountability and, in some cases, to achieve privatization.

Thomas Borcherding considers the question, "why such a large fraction of the government budget (at least 50 per cent) and national product (perhaps 25 per cent) is supplied out of public bureaucracies of various sorts ... why these functions are not undertaken by contracts let to private firms, by vouchers, or by ... regulation." (pages 100-101).

Marsha Chandler examines "the Politics of Public Enterprise," and in particular she focuses on the relationship between public ownership and political parties. "Because they recruit political elites through elections and bear responsibility for public policy as governments, political parties are inevitably at the centre of the political process ... The question before us is whether partisan political forces influence the use of public ownership and if so, how." (page 186)

Langford and Huffman examine specific Federal Crown Corporations, while Vining and Botterell study the origins, growth, size and functions of Provincial Crown Corporations. Palmer, Quinn, and Resendes concentrate on

a thorough analysis of one particular institution, the Gray Coach Lines Ltd., which is a wholly owned subsidiary of the Toronto Transit Commission which is an independent municipal authority. Sandford Borins looks at the Crown Corporations that were created specifically during World War II as a mechanism for achieving rapid war mobilization.

Taken as a whole, these essays illustrate the methodological approach of selecting a particular theme and analyzing it thoroughly across a variety of industrial sectors and over an extended time period. A similar approach is being pursued by several of the same authors in a new project, The Political Economy of Business Bailouts. Here they examine the characteristics of firms that have received bailouts, as well as the decision-making process followed by governments in their evaluations of financially troubled companies. The economic impact and political implications of bailouts will be scrutinized. This analysis will consider the wide variety of techniques available to a government in its bailout decisions.

In their book on the motion picture industry, Daniel Lyon and Michael Trebilcock examine the choice of instruments for a particular sector. They discuss a variety of such instruments, many of which share the same purpose, the development of a Canadian film industry. These include the National Film Board, Canadian Film Development Corporation, Canada Council, Provincial and Municipal Programs, Regulation, and Tax Incentives. Lyon and Trebilcock compare the attempt to protect the private interests of the film industry with the attempt to support the public cultural interest. The authors conclude that private interests seem to have benefitted much more from current policies than has any public interest.

In 1982, the Council published a book, by Scheffman and Appelbaum, examining Social Regulation in Markets for Consumer Goods and Services. The authors attempt to develop a theory of regulation as an instrument of

industrial policy, particularly in regard to occupational licensing and certification. They urge greater use of 'sunset' provisions and of information requirements, and they suggest that the imposition of greater producer liability may be an efficient policy, especially for products where failure entails health or safety hazards. They discuss the problems involved in the federal-provincial division of powers. Canada is a national market for most products, and so regulation must be developed on a national basis. Yet much of the constitutional responsibility in this area is held by the provinces.

X Division of Industrial Policy Responsibilities Among Federal, Provincial, and Municipal Governments

Studies by Bossons, Makuch, and Palmer have examined municipal licensing. The Ontario Municipal Act, for example, grants municipalities regulatory authority over seventy-two specific categories of trades, and the proposed revision to this Act will extend a general power to municipalities to license, govern, or regulate any business. The authors support this role for municipalities:

> "At the municipal level it is often easier to match the amount and type of regulation with differing local needs. Government responsiveness to consumer concerns can also be improved in some instances if done at the local level. As mentioned before, inadequate information can lead to market failure. Often information about the competence of tradesmen, for example, can be circulated much more easily at the municipal level. Bossons and Makuch also argue persuasively that many negative externalities associated with land uses should be regulated through licensing at the local level where officials are most likely to be responsive to local variations in regulatory needs." (pg. 18)

Harry Kitchen has recently undertaken a study of municipal industrial policy, seeking to ascertain the rationale and optimal mechanics for this type of government intervention. A community with substantial unemployment and/or excess capacity in municipal services may reasonably offer greater inducements for industrial expansion than would a community whose labour force and municipal services are fully employed. Here again, local action may be the most appropriate means of dealing with differences among communities.

Paul Davenport has undertaken a study of The Varieties and Effects of Canadian Industrial Policies: An Inter-Jurisdictional Comparison. In recent years several Canadian jurisdictions - most notably, the federal government,

and the provinces of Ontario, Quebec, Alberta, British Columbia and Manitoba - have announced principles which are to guide the development of industry within their borders. This study will survey the various kinds of industrial policies in Canada, focusing on a comparison of the impact of federal and provincial policies in Ontario and Quebec. The study is divided into six parts:

1. Industrial Policies in Ontario
2. Industrial Policies in Quebec
3. Industrial Policies in the West and the Atlantic Provinces
4. Federal Industrial Policies
5. Industrial Policies and Industrial Performance: A Comparison of Quebec and Ontario
6. Federal Responses to Province-Building

The first four parts of the study will consider the intent, content, and impact of industrial policies in the various jurisdictions. With regard to intent, Davenport is comparing and contrasting the governments' declared purposes to see to what extent they are consistent both with one another and with promoting efficient specialization within the Canadian economic union. A major concern is to determine whether the principles which have been propounded are consistent with the doctrine of comparative advantage, which to most economists is an important requirement for efficiency in an economic system.

Davenport's examination of content will attempt to describe the various provincial and federal policy packages which have actually been brought into effect. In part, this will involve gathering and comparing expenditures under the various jurisdictions' programs as well as assessing the (possibly varying) styles of regulation in the different jurisdictions. An attempt is

also being made, however, to provide a more precise categorization of the industries to which financial aid has been directed. Preliminary investigation suggests it should be possible to dovetail federal and provincial budget data with census data for manufacturing in a way which allows the effective generosity of industrial aid to be regressed on various characteristics of the recipient industries. It would obviously be extremely helpful to know whether aid tended to be targeted at industries with smaller or greater than average sized firms, with slower or faster than average growth of output, with more or less than average R & D expenditures, and with greater or smaller than average use of labour.

Finally, Davenport is considering the impact of industrial policy, and attempting to judge whether the various jurisdictions' policies further the ends at which they have been declared to aim. Whenever it seems sensible he will also suggest whether the different jurisdictions' policies clash with one another or whether there might be room for some inter-jurisdictional accommodation which would raise the level of well-being of all Canadians.

Part 5 will begin with a comparison of certain indicators of industrial performance over the last decade in Quebec and Ontario. In general terms, real wages and productivity have risen more rapidly in Quebec, while employment has expanded more rapidly in Ontario. Davenport will assess the degree to which these variables may have been influenced by federal and provincial industrial policies, with particular reference to the appropriateness of policies in Ontario.

The sixth and final part of the study will consider possible federal responses to 'province-building' and the fragmentation of the Canadian common market. He will investigate the role of equalization and other federal transfers in the maintenance of a common economic purpose across the country.

The most thorough study to date of Federalism and the Canadian Economic Union consists of twelve articles, edited by Trebilcock, Prichard, Whalley, and Courchene. This project has been a response to the federal government's discussion paper, Securing the Canadian Economic Union in the Constitution. For the Council, it represents a natural advance beyond its earlier publication by Ed Safarian, Ten Markets or One? Regional Barriers to Economic Activity in Canada.

The papers in this volume examine various aspects of the current interprovincial and interregional obstacles to the free flow of capital, labour, and products. The book is divided into four parts. The first part examines these issues from a theoretical perspective, considering the advantages and disadvantages of decentralization and the sharing of responsibilities within a federal state. The second part of the book is empirical, attempting to estimate welfare losses caused by interregional barriers and presenting a catalogue of both federal and provincial barriers. Interestingly, the federal government is found to be responsible for a large proportion of these barriers.

The third part of the book examines case studies of specific types of barriers through an analysis of the experiences not only of Canada, but also of the European Economic Community, the United States, and the General Agreement on Trade and Tariffs. The fourth part of the book presents reform options for Canada.

XI Adjustment to Changing International Economic Relations

In a small, open economy the impact of industrial policies can be affected to a significant degree by changes in international economic relations. Many of the studies described above contain important sections devoted to the analysis of the impact of such changes. The general equilibrium model developed by Richard Harris focuses on the effects of trade liberalization on the number and size of firms in particular industries. Gillen and Tapon's study of the Canadian pharmaceutical industry takes into consideration the tax opportunities offered by other nations and the opportunities for firms to move from Canada in response to such concessions. Anderson and Bonsor compare the effects of U.S. and Canadian investment incentives on the location decisions of pulp and paper firms. Kotowitz notes the difference between R&D that results in a product or process that is new in a world-wide sense and R&D that results in the domestic imitation of innovations originally developed in other countries.

A number of studies will focus exlusively on international economic relationships; and their methodologies and themes deserve special consideration.

John Whalley is organizing a conference on Canada-U.S. Trade and Investment policy frictions to take place at the University of Western Ontario, November 18-19, 1983. A series of papers will cover a wide variety of subjects regarding Canada-U.S. relations, including free trade options, Canadian investment and energy policies, government procurement policies, and the Auto Pact.

Another study undertaken by the Council is entitled Interregional Effects of Canadian Tariff and Transportation Policies with Special Reference to Ontario, by Jim Melvin. The Study proposes to analyze the effects of tariff

and interregional transportation policies in a theoretically consistent model. The project will examine how the effectiveness of a tariff depends on transportation costs and policies, in increasing the share of the domestic market served by domestic firms. While research has been completed on each of these topics separately, to date very little work has considered how the policies interact. The researcher believes the two policies should be considered as substitutes and that policy should be designed to reflect this fact. As well, the work will outline what the interregional effects of existing tariff and transportation policies have been.

Fuss and Waverman have developed a project on International Productivity Differences among Automotive Manufacturers.

Fuss and Waverman intend to use the cost function approach (developed by them for the study of Bell Canada) to study productivity and cost differences in automotive manufacturing (transportation equipment) among countries.

The cost function approach is based on duality theory, which can be used to demonstrate that a general transformation function of the form:

$$F(Q_1, \ldots Q_m; X_1, \ldots, X_n; T_1, \ldots, T_k) = 0$$

can be represented by a cost function:

$$C = g(P_1,\ldots,P_n;Q_1,\ldots,Q_m;T_1,\ldots,T_k)$$

where the Q's are outputs, X's are inputs, T's are indicators of technical change, and P's are the factor prices in the n inputs.

Statistically, the cost function is approximated by a second order translog cost function: (one output and one technical change indicator are assumed)

$$\ln C = b_o + \sum_{i=1}^{5} \ln P_i + \tfrac{1}{2} \sum_{i}^{5} b_{ii} (\ln P_i)^2 + b_q \ln Q$$
$$+ \tfrac{1}{2} b_{qq} (\ln Q)^2 + b_T \ln T + \tfrac{1}{2} b_{TT} (\ln T)^2$$
$$+ \sum_{i \neq j} \sum \ln P_i \ln P_j + \sum_{i=1}^{5} b_{iq} \ln P_i \ln Q$$
$$+ \sum_{i=1}^{5} b_{iT} \ln P_i \ln T$$

This cost analysis, applied for 2 digit and 3 digit industry data for Canada, the U.S.A. and Japan for the period 1954 to 1980, should yield the following results:

1. estimates of economies of scale,

2. estimates of levels and changes in
   - labour productivity
   - total factor productivity

3. contributions to unit cost differences of:
   - wage rates
   - material costs
   - economies of scale
   - total factor productivity
   - managerial efficiency

4. contribution to labour productivity of:
   - capital additions,
   - labour additions
   - economies of scale
   - technical change
   - managerial efficiency

5. contribution to measured labour productivity and unit cost differences of exchange rate changes.

XII Conclusions

1. There are a large number of methodologies and themes that are appropriate and useful for the analysis and evaluation of industrial policies. In industrial policy research, an important issue is the choice of the most suitable methodology and/or theme. This will vary depending upon the type of policy being examined, the nature of the particular industry's production process at a particular point in time, the current state of the relevant economic theory and econometrics, and the availability of data.

2. Innovation is occurring rapidly in this research area. Twenty years from now much current research will be seen as rudimentary.

3. We may expect that advances in this area will clarify the quantification of costs and benefits arising from particular industrial policies. Furthermore, the allocation of adjustment costs will receive more attention. To what extent should government pay for the adjustment costs suffered by employees and shareholders? Increasingly, research will concentrate on the analysis and representation of consumer interests in industrial policies. Current institutional arrangements have tended to ignore consumer interests in the decisions about industrial policies, responding more directly to the interests of employees and shareholders. Furthermore, research will focus on the entrenchment of rights through industrial policies and the mechanisms that may be necessary to reduce or eliminate such rights, after these rights have become entrenched.

4. We may expect greater precision in definitions of terms such as "a product", "an industry", "a high-tech industry", and "a labor skill".

With these clarifications, a greater sophistication in the analysis of the elasticity of substitution is likely, together with a clearer discrimination in theory and estimation in regard to different qualities. In this area, much research will focus on quality in addition to the traditional emphasis on quantity.

5. Verbal descriptions will be supplemented increasingly with statistical analysis. This will place greater emphasis on the acquisition and storage of data by government agencies and on the conditions under which researchers may gain access to such data. In particular, in Canada, we may hope for more public data and more data availability at the firm level and at the regional level. Current institutional arrangements for the acquisition and dissemination of data should be re-examined in view of these likely developments.

6. At present, few studies look to other nations for lessons that may be learned, apart from lessons in pure theory and econometrics. It is likely that this will change and that "comparative economic systems" will acquire a new subject matter as researchers compare industrial policy experiences in different nations in order to develop general insights and conclusions. This tendency will be supplemented by the need to consider the industrial policies of other nations in order to evaluate the competitive position of domestic firms. The growing significance of international trade, the rapid changes in existing trade patterns, and the growth in industrial policies in most nations will all create a new emphasis on international comparisons. In this, the relationships between trade policies and other industrial policies will receive new attention.

7. Public policy decisions have to be reached in spite of the rudimentary state of industrial policy research. Already, industrial policies are significant, and they are likely to be constantly modified. Consequently, it is necessary for public policy analysts to present insights and advice. In this process, traditional economic theory does provide guidance. With the current state of research, recommendations also have to rest upon subjective perception and the wisdom of the observer.

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Conklin, David W.

Methodologies and themes for the analysis and evaluation of industrial policies.